WHAT IS CLAIMED IS:

1. A system for measuring surface properties of a polishing pad comprising:

a polishing pad having a polishing surface associated therewith;

an ultrasonic probe located over said polishing surface and configured to both transmit an ultrasonic signal to said polishing surface and receive a modified ultrasonic signal from said polishing surface without contacting said polishing surface; and

a subsystem coupled to said ultrasonic probe and configured to determine a surface property of said polishing pad from said reflection.

2. The system as recited in Claim 1, wherein said ultrasonic probe comprises a single ultrasonic transducer.

3. The system as recited in Claim 1, wherein said ultrasonic probe comprises a first ultrasonic transducer configured for said transmitting and a second ultrasonic transducer configured for said receiving.

4. The system as recited in Claim 2, wherein said transmitted ultrasonic signal is between about 2 MHz and about 3 MHz and an air

gap located between said probe and said polishing surface is between about 12 mm and about 25 mm.

5. The system as recited in Claim 4, wherein said transmitted ultrasonic signal is about 3 MHz and said air gap is about 12.5 mm.

6. The system as recited in Claim 1, wherein said polishing pad comprises:

a thermoplastic foam substrate; and

a polishing agent coating said polishing surface of said substrate.

7. The system as recited in Claim 6, wherein said thermoplastic foam substrate comprises a crosslinked polyethylene closed-cell foam.

8. The system as recited in Claim 6, wherein said polishing agent is selected from a group of ceramics consisting of:

Silicon Dioxide;

Titanium Dioxide;

Tetraethoxy Silane Polymer; and

Titanium Alkoxide Polymer.

9. The system as recited in Claim 6, wherein said polishing agent is selected from a group of polymers consisting of:

Polyalcohols; and

Polyamines.

10. The system as recited in Claim 1, wherein said surface property is selected from the group consisting of:

Density;

Surface Texture; and

Visco-Elasticity.

11. A method for measuring the surface properties of a polishing pad, comprising:

situating an ultrasonic probe above a polishing surface of a polishing pad, without contacting said polishing surface;

transmitting an ultrasonic signal from said probe to said polishing surface, said ultrasonic signal being modified by said polishing surface; and

receiving said modified signal by said ultrasonic probe.

12. The method as recited in Claim 11, wherein said modified signal is a reflected signal received during coating of a polishing agent onto said polishing surface of a thermoplastic foam substrate.

13. The method as recited in Claim 12, wherein said probe and said polishing pad are located in a reaction chamber used for said coating.

14. The method as recited in Claim 13, wherein said coating comprises:

exposing a surface of said thermoplastic foam substrate to an initial plasma reactant to produce a modified surface thereon; and

exposing said modified surface to a secondary plasma reactant to create said polishing surface on said modified surface, said polishing surface comprised of said polishing agent.

15. The method as recited in Claim 12, wherein said coating includes exposing a plastic substrate to a polishing agent dissolved in a supercritical fluid to thereby produce a modified plastic.

16. The method as recited in Claim 11, wherein said polishing pad and said probe are coupled to a polishing apparatus comprised of a mechanically driven carrier head and a polishing platen.

17. The method as recited in Claim 16, wherein said polishing pad is attached to said polishing platen and said transmitting and said receiving are carried out while said carrier head holds a wafer and imparts a polishing force against said polishing pad to polish a wafer.

18. The method as recited in Claim 11, wherein said modified signal is a reflected signal used to calculate an acoustic reflectance spectrum of said polishing surface.

19. The method as recited in Claim 18, wherein said reflected signal is used to determine an acoustic reflectance image of said polishing surface.

20. The method as recited in Claim 11, wherein said modified signal is a transmittance signal used to determine a relative density of said polishing surface.

21. The method as recited in Claim 20, wherein said transmittance signal is used to determine a surface texture of said polishing surface.